Chapter Three

METHODOLOGY

Chapter 3.0 Methodology

3.1 Basic Methodology

This study employs a holistic approach that investigates the social economic and environmental aspects of the development activities in order to assess the sustainability of CH. As the research study involves interdisciplinary fields, both quantitative and qualitative analyses have to be used. The main methodology adopted in this study was library research and review of scientific reports on various relevant topics. However, there were some sections that required quantitative analysis of secondary data to establish the case. Nevertheless, the design of this study did not require collection of primary data and fieldwork.

In the Pressure-State-Response (PSR) framework, this research study investigates the anthropogenic activities in order to understand the pressure of development and the pressure on the environment. Then, the assessment of the changes of the environmental quality was performed to establish the "State" of the environment. Discussions and suggestions were forwarded to recommend appropriate society response. However, complete indicators of sustainability will not be outlined in this dissertation. **Fig. 3.1.1** shows a schematic diagram of the analysis in this dissertation. A more detailed methodology for each chapter is discussed in the following.

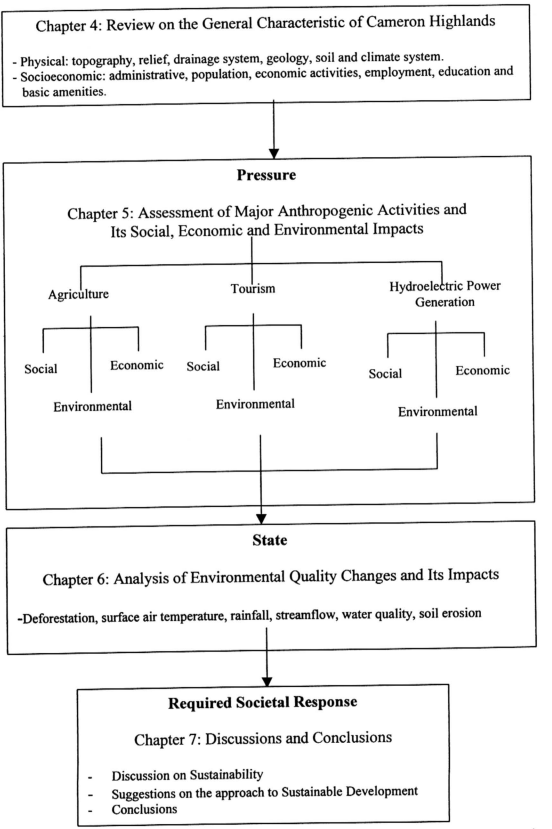

Fig. 3.1.1: Schematic Diagram of the Steps of the Analysis

3.2 Review on General Characteristics of Cameron Highlands

In Chapter 4, the historical development of the CH is summarized based on available literature. Review was performed on the physical characteristics of CH, which includes the topography, relief and drainage system, climate regime, geology and soil. However, rainfall data was analyzed in greater details to understand the monthly distribution and characteristics.

The study of socioeconomic characteristics includes the administrative district, population, economic activities, employment and other minor indicators such as education and basic amenities. These analyses utilized official and forecast data released by the district council and the Department of Statistics.

3.3 Assessment of Major Anthropogenic Activities and Its Social, Economic and Environmental Impacts of Cameron Highlands

Three major anthropogenic activities viz. agriculture, tourism and hydroelectric power generation in CH were assessed in Chapter 5 based on social, economic and environmental implications. Library research was required to understand the historical development and the likely general scenario of the activities. The importance of these anthropogenic activities was reviewed in the perspective of economic significance and social implications. Current practices of these activities and their relations with the environment were also scrutinized. Land use data was digitized from the topography and land use maps. Quantitative analysis using geographical information system (GIS) was performed in the collaboration project of UM-TNBR. Based on these data, land use changes with the focus on different slope gradients were analyzed for the past 50 years.

The economics of agriculture activities, including tea, vegetable and floriculture, was assessed in national, local and farm perspectives. Data on the production of various agricultural products was obtained from literature and unpublished reports of FAMA in CH. The social aspects of agriculture were included with respect to employment contribution, labor, land tenure issue and health. The interrelation of agricultural activities with the environment is analyzed in both watershed and field scales as proposed by Smith and McDonald (1998).

The economic contributions of tourism industry in CH were analyzed based on data collected by the relevant government agencies. The analysis includes trends of tourism population, tourist receipts and development in infrastructure and other service industry. The impacts of tourism to the mountain society were also assessed, such as local ownership of the industry and properties, negative effects of increasing tourist populations and also the response of local population towards the changes in their community. The impacts of tourism on environment were assessed based on Pearce's (1985) proposed framework. It involved analysis of environmental stress generated by the tourism industry, then the environmental and societal responses to the stresses.

The UM-TNBR project contained detailed information regarding the physical and engineering aspects of the hydroelectric scheme, which is required as background for understanding the nature of this scheme and its implication on the environment. The economic importance of the hydroelectric scheme to generate green energy has been assessed. The implication and economic loss due to the degradation of environmental quality were also estimated. Furthermore, the social impacts of the construction of this

hydroelectric scheme were reviewed and the impacts on the environment during the construction of the scheme were also discussed.

3.4 Analyses of Environmental Quality Changes

The objective of Chapter 6 is to evaluate the changes of environmental quality over the last 4 decades. The impacts of specific anthropogenic activity on a specific environmental quality have been discussed in Chapter 5 in order to establish the cause and effect relationship. However, Chapter 6 was not designed to quantify those relationships. It provided indication of current status and trends of the state of the environment.

The analysis of the state of the environment was based on secondary data and literature review on the changes in environmental quality. The important parameters to be analyzed are deforestation, air temperature variability, rainfall variability, streamflow variability, water quality changes and soil erosion. The impacts of these environmental quality changes were also evaluated and some have been quantified.

Land use data was analyzed to assess deforestation rate over the last 4 decades and its impacts were also discussed. Temperature and rainfall data from Malaysian Meteorological Service Department and TNB's meteorological station were used to analyze the long-term variability. Long-term streamflow data were obtained from the TNB stations in the field. Water quality review was based on existing scientific reports. The severity of soil erosion was evaluated from the sedimentation data provided by TNB in the UM-TNBR projects. The soil erosion problem is a major issue in CH. Thus, the impacts of soil erosion were also evaluated and discussed in greater details.

3.5 Discussions on the Sustainable Development

The sustainability of CH is discussed in Chapter 7. The implications of the pressure of anthropogenic activities and the consequences of the trends of environmental quality changes were summarized. The basic concepts and principles of sustainable development were used to assess the sustainability of the development of CH.

This chapter then recommended appropriate mitigation measure as societal responses to regulate the development pressure and the environmental deterioration. Lastly, recommendations on key management approaches to achieve sustainable development were presented.